

Civil Design Narrative for Peckman River FRM Measures

1. Existing Conditions and Basemap Information

Existing Ground

The contours shown in the plan views and the corresponding existing ground shown in the profiles and sections were generated using LIDAR data from 2007. This DEM (digital elevation model) was utilized by NAN hydraulic engineers in modeling stormwater flows and provided to NAP designers for display in the drawings.

Planimetrics

The features shown on the plans were sourced from drawings developed by TVGA Consultants dated AUG2004. These features include building outlines, fence locations, roads, power poles, and other elements. This mapping effort was created by TVGA using stereo photogrammetric methods from aerial photography flown at 1" = 600'. This mapping was compiled without the benefit of a field edit. The surface utilities shown were located in the field and underground utilities information were sourced from the various utilities companies.

Imagery

The imagery shown in the general plan is provided by [Digital Globe](#) and was obtained 09FEB2019. The imagery is provided for a visual effect for reviewers to ease understanding of spatial concepts associated with the proposed work. Topographic variation and the tilt of the satellite affect the distance which the features on the image are displayed. These variations contribute to distortion in the image, and therefore the image can only be considered representative of the existing conditions.

Sanitary Sewer Mapping

The sanitary sewer information shown is sourced from the Little Falls Township Sewerage System map prepared by Crew Engineers Inc. and dated APR2002. This mapping was georeferenced with the assistance of Google Earth and can only be considered as representative of the location of the sanitary sewer system in relation to the proposed work.

Storm Sewer Mapping

Storm sewer mapping is incomplete in the TVGA Consultants mapping information and no other source is currently available to determine potential interference.

2. Peckman River Channel Design

The Peckman River modification occurs from Sta. 47+00 to Sta. 65+48 (1,848 linear feet). There is a constant bottom channel width of 40' that has different layers of riprap and subbase throughout the length of the channel. 18" riprap thickness and 9" subbase was designed from Sta. 47+00 to Sta. 50+52 and Sta. 55+84 to Sta. 65+40. 42" riprap thickness and 21" subbase was designed from Sta. 50+52 to Sta. 55+84. These riprap thicknesses were provided by the NAN H&H design group. The side slopes on both sides of the bank are set to 3:1, with the exception from Sta. 53+00 to 51+27 (Weir 1 location) where the condition on the left bank involves the use of a combined retaining and flood wall on the downstream of the culvert inlet. The side slope here transitions from 3:1 to 3.7% to ensure that the

stream bed transitions from a trapezoidal channel to a shallower slope adjacent to Weir 1 (El. 128'). In cases where 3H: 1V side slope required significant fill, the armoring was matched to existing grade. The left bank armoring minimizes fill by creating a 2% sloped bench and ties into the specified channel bottom with a 3H: 1V side slope; this is also true for channel armoring at the right bank below the weir.

Channel Modification Summary Table			
	Length, ft.	Station Start	Station End
Channel Modification	1848	47+00	65+48
18" riprap & 9" subbase	352	47+00	50+52
42" riprap & 21" subbase	532	50+52	55+84
18" riprap & 9" subbase	964	55+84	65+48
Channel Bottom Width	40	47+00	65+48
3:1 Side Slope (Left Bank)	427	47+00	51+27
Side slope varies (Left Bank)	173	51+27	53+00
3:1 Side Slope (Left Bank)	1048	55+00	65+48
3:1 Side Slope (Right Bank)	1848	47+00	65+48
2% armoring (Right Bank)	921	47+00	56+21
2% armoring (Left Bank)	varies*		

*Armoring only needed at minimal locations as indicated on cross sections.

3. Culvert Channel Design

Proposed culvert has a linear distance of 1,408 from Sta. 3+00 to Sta. 17+06 along the Culvert Alignment with a constant slope of 0.77%. The entrance invert elevation of the culvert is at 124.8 feet and the exit invert is set to 114 feet. The height of the culvert is 15' from Sta. 3+00 to 5+25 and Sta. 8+75 to Sta. 16+20. The corresponding width for these section of the culvert is 45.5'. The height of the culvert from Sta. 5+25 to Sta. 8+75 is 17.2' with a corresponding width of 45.5'. The height is increased in this area due to the maximum cover allowed being 5'. The entire length of the culvert is encased with concrete; 2 feet thick on top and 2.5' thick on the bottom. There is also a 2.5' thick riprap subbase for the culvert and is lined with geotextile. From Sta. 16+20 to Sta. 17+06, the height of the culvert is 15', and the width widens from 45.5' to 83'. Retaining wall elevation is set to elevation 140' to match underside of culvert roof as max water elevation. Exit retaining walls are shown at the full length of the stilling basin (85' @ CL, 125' @ exterior side, 23' @ inboard side) in the NAP design. The exit retaining walls in the NAN design are shown at 60' length. See Structural Appendix for more details on culvert design as well as retaining wall design.

Culvert Design Summary Table								
	Length, ft.	Width, ft.	Height, ft.	Station Start	Station End	Slope, %	Entrance Invert, ft.	Exit Invert, ft.
Culvert Design	1,408	varies	varies	3+00	17+06	0.77	124.8	114.0
Culvert Dimension	225	45.5	15	3+00	5+25	0.77	124.8	114.0
Culvert Dimension	350	45.5	17.2	5+25	8+75	0.77	124.8	114.0
Culvert Height	745	45.5	15	8+75	16+20	0.77	124.8	114.0

Channel Bottom Width	86	45.5 to 83	15	16+20	17+06	0.77	124.8	114.0
2' Concrete Encasement (top)	1,408	varies	varies	3+00	17+06	0.77	124.8	114.0
2.5' concrete Encasement (bottom)	1,408	varies	varies	3+00	17+06	0.77	124.8	114.0
2.5' Riprap Subbase	1,408	varies	varies	3+00	17+06	0.77	124.8	114.0

4. Levee and Floodwall Design

There are three (3) sections of floodwalls that are being proposed for the project that are a total of 1,487 linear feet. On the left bank, the floodwall is 288 feet long from Sta. 46+75 to Sta. 49+53 along the Peckman River alignment. The elevation for this portion of the floodwall is set to 145'. On the right bank, the floodwall is 732 feet from Sta. 48+35 to Sta. 56+21 along the Peckman River alignment. The elevation for this portion of the floodwall is set to 145'. The section of floodwall between the track and baseball field is 467'. The elevation for this portion of the floodwall ties into the elevation of the levee at 145'. For further details on floodwall design, please refer to Structural Appendix.

	Left Bank	Right Bank	Between Track and Baseball Field
Length, ft.	288	732	467
Top Elevation, ft.	145	145	145

There are two sections of levees that are being proposed for the project that are a total of 1,890 linear feet. For the section of levee adjacent to the Peckman River, the levee is 1,150 feet long with a top of crest elevation of 145'. For the section of levee adjacent to the track, the levee is 740' long with a top of crest elevation of 145'. Both levee sections have a top of crest width of 12', side slopes of 3:1 to tie into existing ground, and an impervious core that has a minimum depth of 6' into existing ground. The levee sections also have a 6" layer of topsoil and seed. Total width of levee may vary from 40' to 75'. See Figure 1 below.

	Adjacent to Peckman River	Adjacent to Track
Length, ft.	1150	740
Top Elevation, ft.	145	145

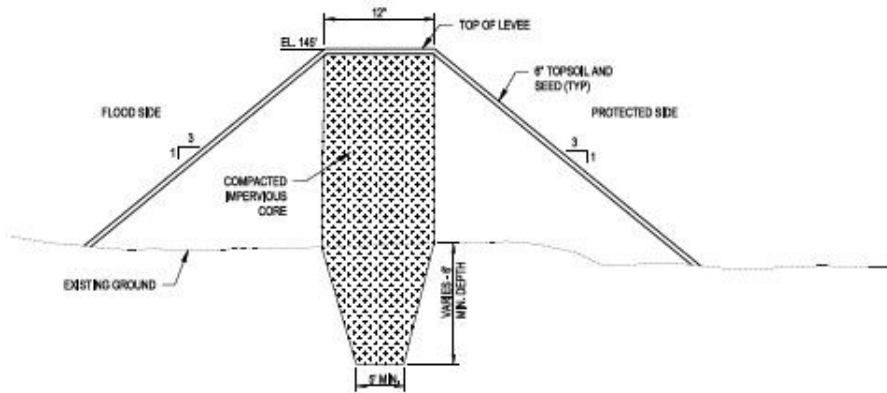


Figure 1 Levee cross section provided by NAN H&H designers.

5. Weir Design

Weir 1 top elevation is set to 130' and weir 2 top elevation is set to 135'. The height for weir 1 is 6.5', has a top width of 2' and is sloped towards the culvert invert at 3:1 (Sta. 17+70 to Sta. 17+89). The length of the weir is 19.25'. The height for weir 2 is 12.25', has a top width of 2' and is sloped downstream the River at 3:1 (Sta. 50+13 to Sta. 50+37). The length of the weir is 34'. Weir 2 also has an opening 3'H x 8'W in order to allow normal flows to continue down the Peckman River. See Figures 2 and 3 below and Structural Appendix for more information on weir designs.

Weir Summary Table				
	Top Elevation, ft.	Height, ft.	Length, ft.	Slope
Weir 1	130	5.5	120	3:1
Weir 2	135	8.25	144	3:1

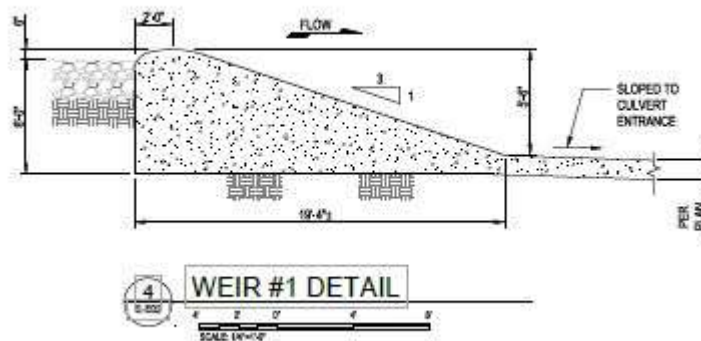


Figure 2 Weir 1 design provided by NAP Structural designers.

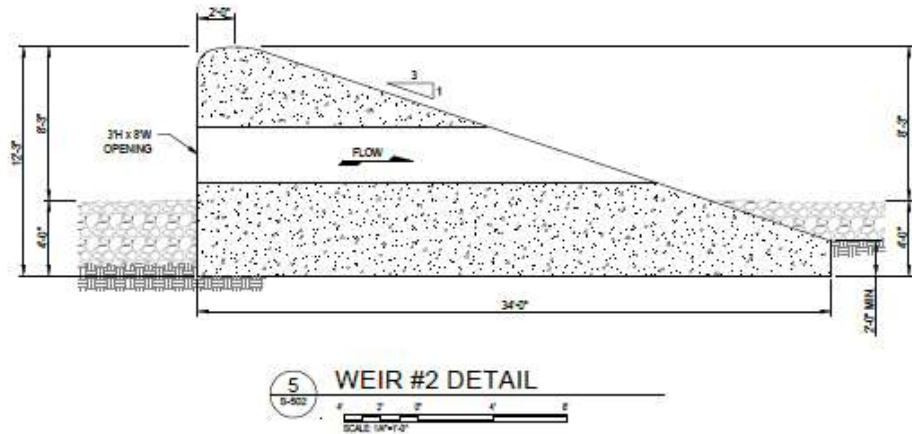


Figure 3 Weir 2 design provided by NAP Structural designers.

6. Future Design Considerations

As the design process continues the following items will need to be further developed in order to fully satisfy BCOES requirements.

Stormwater Flanking Risks

The current design has floodwalls at Elevation +145. These floodwalls do not tie into an equivalent ground elevation, thus affording the opportunity for floodwaters to “flank” the floodwalls.

In the excerpt provided the floodwall ties into an existing contour of +136 and thus a height difference of 9' will allow for stormwater to get behind the flood risk management project, and inundate the protected area. This is typical for all floodwalls and will have to be further reviewed during the next design effort.

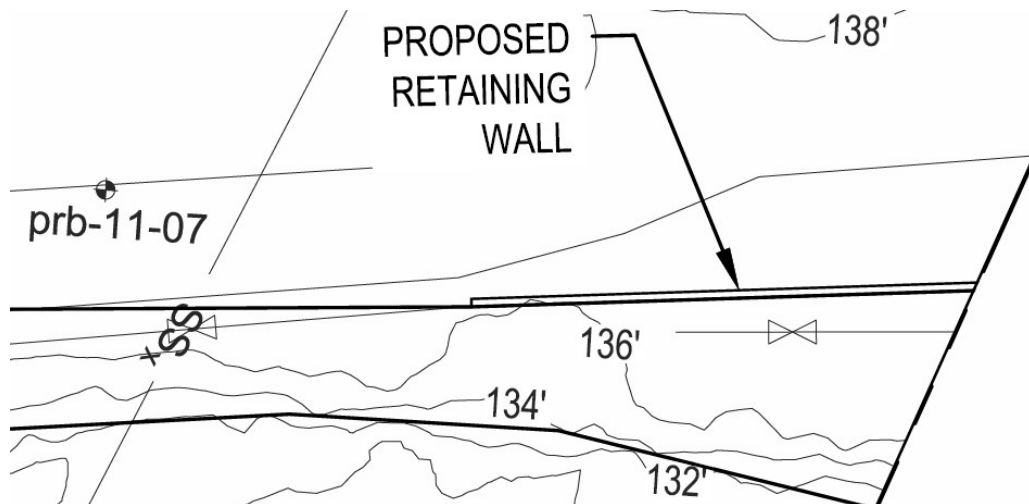


Figure 4 Excerpt from C-103 showing Floodwall (EL+145) and surrounding existing grades.

Peckman River Profile

The current profile design shown on C-201 and C-202 slopes at varying rates from the upstream limit of work to the proposed culvert intersection. If the slope of the profile were to be designed at a constant slope, less excavation and a lower project cost may be a result.

Flood Risk Management downstream of Weir 2

FRM measures downstream of Weir 2 may not be necessary if the channelization, culvert and floodwall/levees perform as expected upstream.

Interference with existing utilities

Existing sanitary sewers cross the proposed FRM project in 4 locations, 3 across the proposed culvert, and one across Peckman River. Two gravity sewer lines will have to be demolished and reconstructed as shown on C-105. One 16" force main that conducts all of Little Falls Township sanitary sewer downstream for further treatment will have to be maintained throughout construction of the proposed culvert, and thus a temporary force main and project phasing may be necessary.

The last identified interference is between the proposed Peckman River channel modifications and the existing 20" gravity sewer at approximately STA 53+50 as shown on C-103. The invert of this pipe is unknown and the proposed channelization will result in a lowering the finish grade of the stream bed by 2'. Modification of the sewer may be necessary if interference exists.

Electrical, water, storm sewer, and communications utilities are not reflected in the drawings and once mapped, are likely to result in additional costs to demolish, temporarily maintain, and reconstruct.